

## STATISTICA: Nonlinear Estimation

File Edit View Analysis Graphs Options Macro Window Help

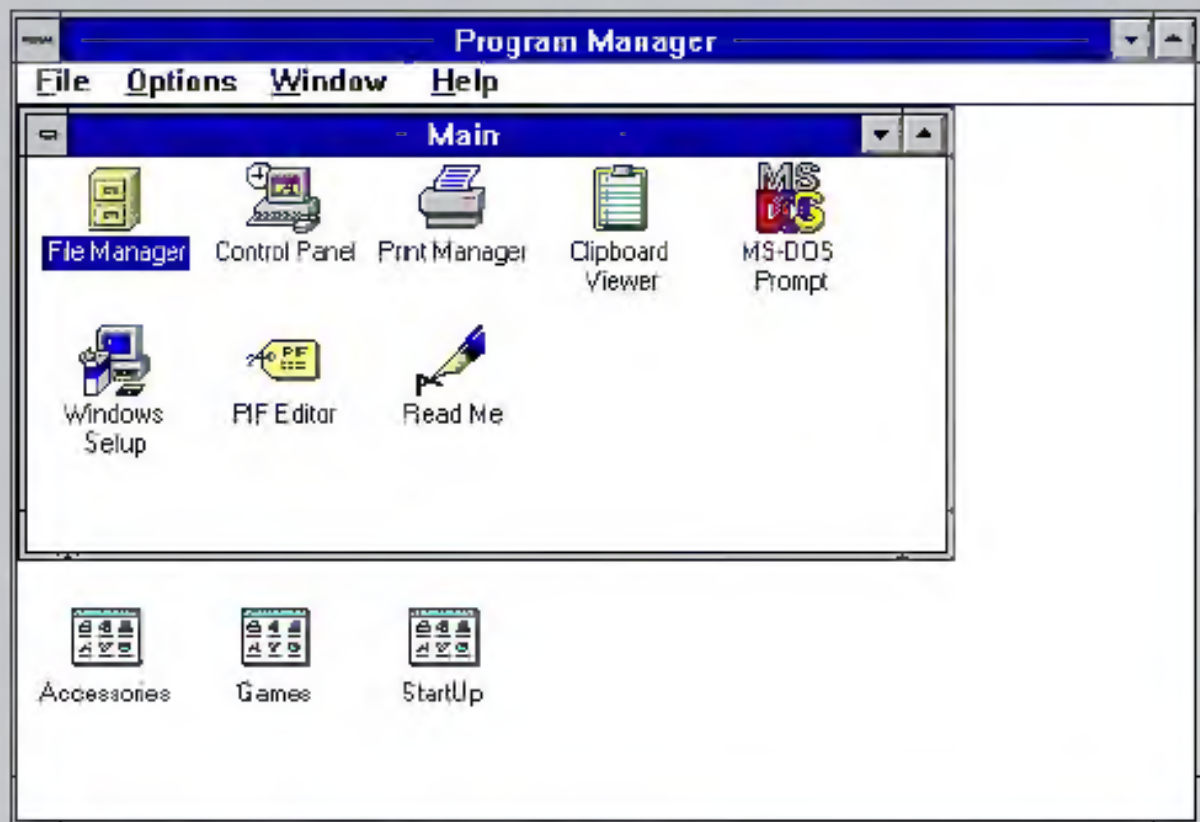
Data: NEW.STA 10v * 10c							
#	1 VAR1	2 VAR2	3 VAR3	4 VAR4	5 VAR5	6 VAR6	7 VAR7
1	0.000	2.500	3.000				
2	1.000	5.500	5.000				
3	2.000	7.000	7.000				
4	3.000	9.000	9.000				
5	4.000	12.000	11.000				
6	5.000	14.000	13.000				
7	6.000	12.000	15.000				
8							
9							
10							

Ready

Output:OFF

Sel:OFF

Weight:OFF



STATISTICA: Nonlinear Estimation

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Vars Cases

Data: NEW.STA 10v \* 10c

#	1 VAR1	2 VAR2	3 VAR3	4 VAR4	5 VAR5	6 VAR6	7 VAR7
1	0.000	2.500	3.000				
2	1.000	5.500	5.000				
3	2.000	7.000	7.000				
4	3.000	9.000					
5	4.000	12.000					
6	5.000	14.000					
7	6.000	12.000					
8							
9							
10							

**Nonlinear Estimation**

- User-specified regression
- Logistic regression
- Probit regression
- Exponential growth regression
- Piecewise linear regression

OK  
Cancel  
Open Data  
SELECT CASES 3

Ready Output:OFF Set:OFF Weight:OFF

File
Edit
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Analysis
Graphs
Options
Macro
Window
Help

Data: NEW.STA 10v \* 10c

#	1 VAR1	2 VAR2	3 VAR3	4 VAR4	5 VAR5	6 VAR6	7 VAR7
1	0.000	2.500	3.000				
2	1.000	5.500	5.000				
3	2.000	7.000	7.000				
4	3.000						
5	4.000						
6	5.000						
7	6.000						
8							
9							
10							

User-Specified Regression Function

Function to be estimated & loss function

Function: none  
Loss: none

Missing data: Casewise

OK

Cancel

SELECT CASIS S

W

#	1 VAR1	VAR2
1	0.000	
2	1.000	
3	2.000	
4	3.000	
5	4.000	
6	5.000	
7	6.000	
8		
9		
10		

### Estimated function and loss function

**Estimated function:**  
 $v3 - \text{const1} * v1 + \text{const2}$

**Loss function:**  
 $L = (\text{OBS} - \text{PRED})^{**2}$

Estimated function: 'estimated var' = expression; e.g.:  $v2 = \text{constant} + \text{beta} * v3$   
 Loss function:  $L = \text{expression}$ ; e.g.:  $L = (\text{obs} - \text{pred})^{**2}$   
 Valid operators: + - \* \*\* / < > >= <= <> = ( )  
 Reference variables by number or name; e.g.:  $v3 = b1 * v4$  or  $\text{COST} = b1 * \text{SIZE}$   
 All unrecognized names are parameters; e.g.:  $v3 = \text{const} + \text{beta} * v4$   
 Use standard or scientific notation; e.g.:  $v3 = b1 * v1 / 3e+2$   
 Constants:  $\text{Pi} = 3.14...$ ;  $\text{Euler} = 2.71...$ ; e.g.:  $v3 = b * \text{Euler} * v3$   
 Functions: abs arcsin cos exp log log2 log10 sign sin sinh sqrt tan  
 Logical operations: true=1, false=0; e.g.:  $v2 = b1 * v3 * (v1 < 0) + b2 * v3 * (v1 >= 0)$   
 In loss function: PRED = predicted value, OBS = observed value  
 Default loss function is 'Least Squares,' that is:  $L = (\text{OBS} - \text{PRED})^{**2}$   
 Example 1:  $\text{Failure} = \exp(b0 + b1 * \text{Strength})$   $L = v5 * (\text{OBS} - \text{PRED})^{**2}$   
 Example 2:  $v4 = \exp(a + b1 * v4) / (1 + \exp(a + b1 * v4))$   $L = \text{weight} * \text{abs}(\text{OBS} - \text{PRED})$

Define the function; For help, press F1

Output:OFF

Set:OFF

Weight:OFF



Data: NEW.STA 10v \* 10c

#	1 VAR1	2 VAR2	3 VAR3	4 VAR4	5 VAR5	6 VAR6	7 VAR7
1	0.000	2.500	3.000				
2	1.000	5.500	5.000				
3	2.000	7.000	7.000				
4	3.000						
5	4.000						
6	5.000						
7	6.000						
8							
9							
10							

**User-Specified Regression Function**

Function to be estimated & loss function

Function:  $v3 = \text{const1} * v1 + \text{const2}$

Loss:  $(\text{OBS} - \text{PRED})^2$

Missing data: Casewise

OK Cancel

SELECT CASIS S

## Model Estimation

Model is:  $v3 = \text{const1} * v1 + \text{const2}$ 

Number of parameters to be estimated: 2

Loss function:  $(\text{OBS} - \text{PRED})^{**2}$ 

Dependent variable: VAR3

Independent variables: VAR1

Missing data are casewise deleted

Number of valid cases: 7

Estimation method: Quasi-Newton

☐ Asymptotic standard errors☐ Cla for finite diff. approx., 1 E: 8

Maximum number of iterations: 50

Convergence criterion: .00010

 Start values: .1 for all parameters Initial step size: .50 for all parameters Means & standard deviations Matrix plot for all variables Box & whisker plot for all vars.

OK

Cancel

## Model Estimation

Model is:  $v3 = \text{const1} * v1 + \text{const2}$ 

Number of parameters to be estimated: 2

Loss function:  $(\text{OBS} - \text{PRED}) ** 2$ 

## Parameter Estimation

Iteration	Loss	Parameters
-----------	------	------------

* 5		
* 6		
* 7		
* 8		
* 9		
* 10		
* 11		
*		

## STATISTICA



Predictors are probably very redundant;  
estimates suspect

OK

Cancel

OK

Convergence criterion: .00010

Results &amp; standard deviations

Start values: .1 for all parameters

Matrix plot for all variables

Initial step size: .50 for all parameters

Box &amp; whisker plot for all vars.

Computing: please wait...

Output:OFF

Sel:OFF

Weight:OFF



## Model Estimation

Model is:  $v3 = \text{const1} * v1 + \text{const2}$ 

Number of parameters to be estimated: 2

Loss function:  $(\text{OBS} - \text{PRED}) ** 2$ 

## Parameter Estimation

Iteration	Loss	Parameters
* 5	.000000	1.99994 3.00020
* 6	.000000	1.99994 3.00016
* 7	.000000	1.99994 3.00016
* 8	.000000	1.99997 3.00008
* 9	.000000	2.00000 3.00000
* 10	0.00000	2.00000 3.00000
* 11	0.00000	2.00000 3.00000
*		



STATISTICA: Nonlinear Estimation

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Model Estimation

Model is:  $v3 = \text{const1} * v1 + \text{const2}$   
 Number of parameters to be estimated: 2  
 Loss function:  $(\text{OBS} - \text{PRED}) ** 2$

Parameter Estimation

Iteration	Loss	Parameters
* 5	.000000	
* 6	.000000	
* 7	.000000	
* 8	.000000	
* 9	.000000	
* 10	0.00000	
* 11	0.00000	
*		

STATISTICA

View results anyway?

Yes No

Cancel OK

Convergence criterion: .00010

Start values: .1 for all parameters

Initial step size: .50 for all parameters

Matrix plot for all variables

Box & whisker plot for all vars.

Computing: please wait... Output:OFF Set:OFF Weight:OFF

## Model Estimation

Model:  $1.5^* V^3 = \text{const}_1 * V_1 + \text{const}_2$ 

Number of parameters to be estimated: 2

Loss function: OBS PRED \*\*2

## Parameter Estimation

Iteration	Loss	Parameters
* 5	.000000	1.99994 3.00020
* 6	.000000	1.99994 3.00016
* 7	.000000	1.99994 3.00016
* 8	.000000	1.99997 3.00008
* 9	.000000	2.00000 3.00000
* 10	0.00000	2.00000 3.00000
* 11	0.00000	2.00000 3.00000
*		

Parameter estimation process converged

Cancel

OK

Convergence criterion: 0.0010

Means &amp; standard deviations

Start values 1 for all parameters

Matrix plot for all variables

Initial step size 50 for all parameters

Box &amp; whisker plot for all vars

## Results

Model is  $V3 = \text{const}_1 * V1 + \text{const}_2$ 

Dependent variable: VAR3

Independent variables: 1

Loss function: OBS PRED \*\*2

Final value: 0.000000000

Proportion of variance accounted for: 1.000000000 R = 1.000000000

Parameter estimates

Fitted 2D function &amp; observed vals

OK

Cancel

Distribution of residuals

Residual values

Normal probability plot of residuals

Predicted values

Half-normal probability plot

Observed values

Predicted vs. observed values

Means &amp; standard deviations

Predicted vs. residual values

Matrix plot for all variables

Save predicted and residual values

Box &amp; whisker plot for all vars.

Model is  $V3 = \text{const}_1 * V1 + \text{const}_2$ 

Dependent variable: VAR3

Independent variables: 1

Loss function: OBS PRED \*\*2

Final value: 0.000000000

Proportion of variance accounted for: 1.000000000 R = 1.000000000

Parameter estimates

Fitted 2D function &amp; observed vals

OK

Cancel

Distribution of residuals

Residual values

Normal probability plot of residuals

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Observed values

Predicted vs. observed values

Means &amp; standard deviations

Predicted vs. residual values

Matrix plot for all variables

Save predicted and residual values

Box &amp; whisker plot for all vars.



Data NEW STA 10v \* 10c

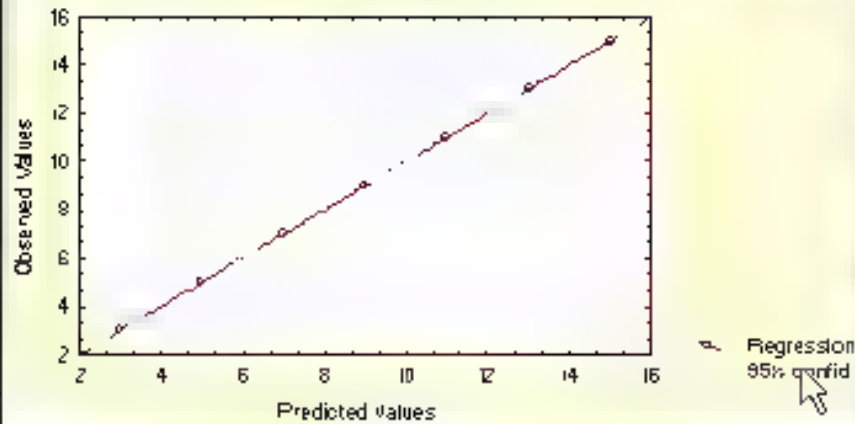
## Observed versus Predicted Values

Continue

Observed versus Predicted Values

Observed values = 0.0000 + 0.0000 Predicted values

Correlation = 0.000



Cont

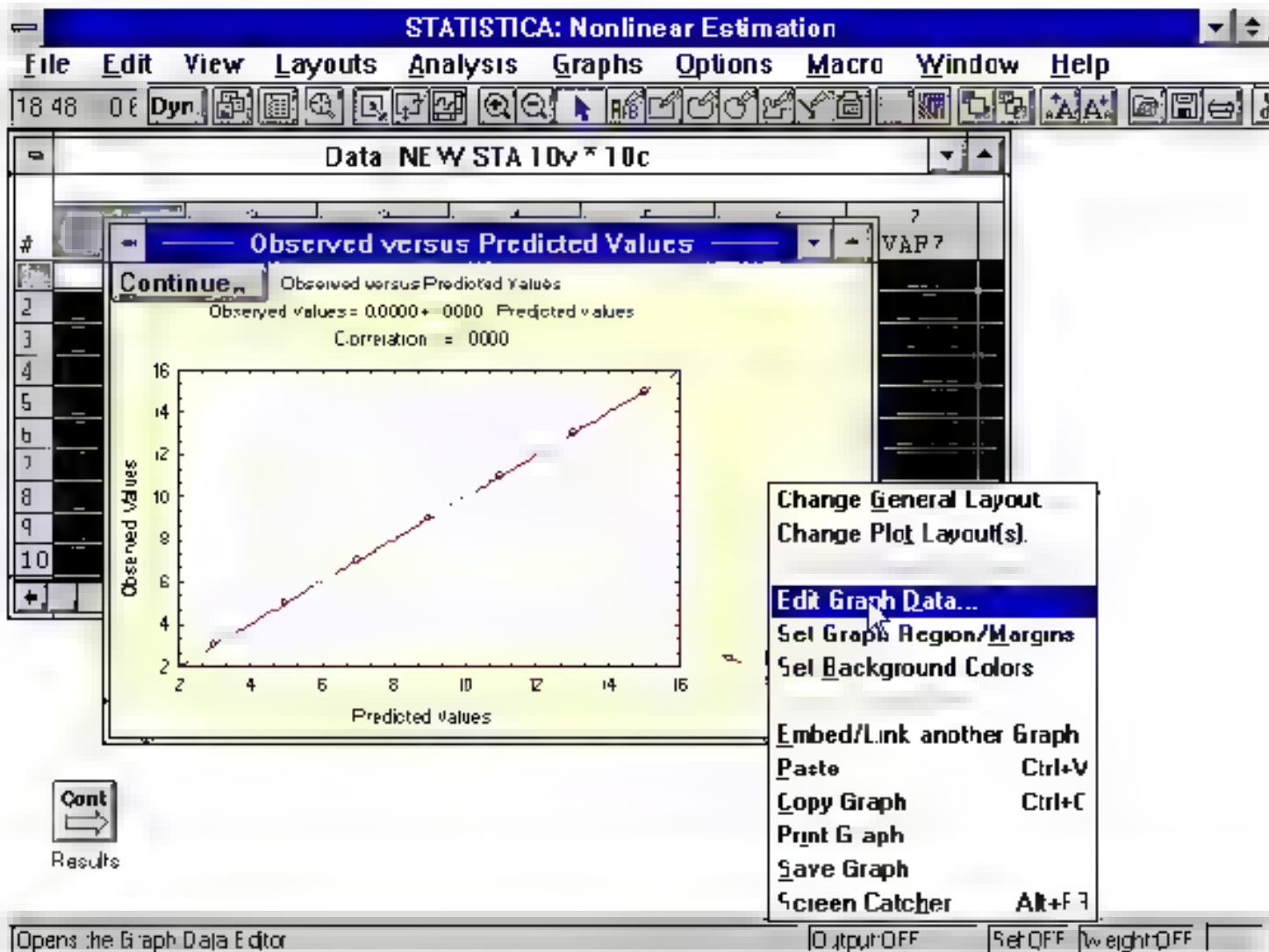
Results

Ready

Output OFF

Sel OFF

Weight OFF



3 000000

Redraw

Exit+Redraw

F/L

8/L

+

-

0.00

0.00

+

-

0.00

0.00

Data NEW STA 10v \* 10c

Observed versus Predicted Values

Continue

Observed versus Predicted Values

Graph Data: Obser

ted values

Observed versus Predicted

Observed values = 0.0000

Regression

Scatterplot

3.00

3.00

5.00

5.00

7.00

7.00

9.00

9.00

11.00

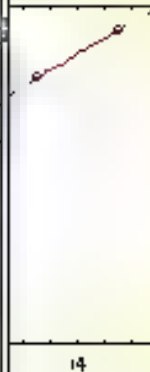
11.00

13.00

13.00

15.00

15.00



Regression  
95% confid

Cont

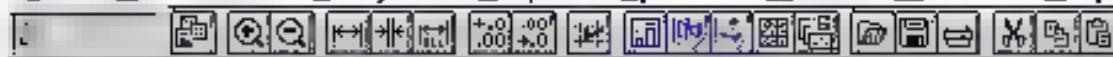
Results

Ready

Output OFF

Set OFF

Weight OFF



Data NEW STA 10v * 10c							
#		2 VAR2	3 VAR3	4 VAR4	5 VAR5	6 VAR6	7 VAR7
1	0.000	2.500	3.000				
2	1.000	5.500	5.000				
3	2.000	7.000	7.000				
4	3.000	9.000	9.000				
5	4.000	12.000	11.000				
6	5.000	14.000	13.000				
7	6.000	12.000	15.000				
8							
9							
Model: v3=const1*v1+const2 (new.sta)							
Continue		Dep var	VAR3	Loss	OBS	PRED	**2
		Final loss	0.00000000	R=1.0000	Variance explained	.0000	
N=7				CONST 2			



Results

Ready

Output: OFF

Set: OFF

Weight: OFF

## Results

Model is  $V3 = \text{const}_1 * V1 + \text{const}_2$ 

Dependent variable: VAR3

Independent variables: 1

Loss function: OBS PRED \*\*2

Final value: 0.000000000

Proportion of variance accounted for: 1.000000000 R = 1.000000000



Parameter estimates



Fitted 2D function &amp; observed vals



OK



Distribution of residuals



Cancel



Cancel



Residual values



Normal probability plot of residuals



Predicted values



Half-normal probability plot



Observed values



Predicted vs. observed values



Means &amp; standard deviations



Predicted vs. residual values



Matrix plot for all variables



Box &amp; whisker plot for all vars



Save predicted and residual values



Box &amp; whisker plot for all vars



# STATISTICA: Nonlinear Estimation

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Data NEW STA 10v \* 10c

Predicted Values (new.sta)

Continue...

5  
VAR5

6  
VAR6

7  
VAR7

3.00000

5.00000

7.00000

9.00000

11.00000

13.00000

15.00000

Model:  $y_3 = \text{const1} * v_1 + \text{const2} (\text{new.sta})$

NONLIN Dep var. VAR5 Loss OBS. PRED \*\*2  
ESTIMAT Final loss. 0.000000000 R=1.0000 Variance explained. 100.00

N=7

CONST2

2.000000

3.000000

Cont

Results

Ready

Output OFF

Set OFF

Weight OFF

STATISTICAL Nonlinear Estimation

File Edit View Analysis Graphs Options Macro Window Help

Data NEW STA 10v \* 10c

Predicted Values (new sta)

Observed Values (new sta)

Continuc...

#	Case	Observed Values (new sta)	5 VAR5	6 VAR6	7 VAR7
2	C 2	3.00000			
3	C 3				
4	C 4				
5	C 5	5.00000			
6	C 6	7.00000			
7	C 7	9.00000			
8	C 5	11.00000			
9	C 6	13.00000			
10	C 7	15.00000			

Model: y1 + const2 (new sta)

NONLIN Dep var VAR5 Loss OBS PRED \*\*2

ESTIMAT Final loss 0.000000000 R=1.0000 Variance explained 100.00

N=7

Model: y1 + const2



Results



**STATISTICA: Nonlinear Estimation**

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Startup Panel Ctrl+S  
Resume Analysis Ctrl+R

- User specified regression
- Logistic regression
- Probit regression
- Exponential growth regression
- Piecewise linear regression
- Other Statistics

#	VAR1	VAR2	VAR3	VAR4	VAR5	VAR6	VAR7
1	0.000	2					
2	1.000	5					
3	2.000	7					
4	3.000	9					
5	4.000	12.000	11.000				
6	5.000	14.000	13.000				
7	6.000	12.000	15.000				
8							
9							
10							

Dep. var	VAR1	LOSS	FOREFITTED**2
ESTIMAT	Final loss	0.000000000	R=1.0000 Variance explained: 100.00
N=7			CONST2
	2.000000		3.000000



Results



Correlations  
NEW STA  
100%...

Brings up the starting dialog box for the current data analysis

Output OFF

Set OFF

Weight OFF

#		Var
1	0.000	
2	1.000	
3	2.000	
4	3.000	
5	4.000	
6	5.000	
7	6.000	
8		
9		
10		

**Estimated function and loss function**

**Estimated function:**

$v2 - \text{const3} * v1 + \text{const4}$

**Loss function:**

$L = (\text{OBS} - \text{PRE D}) ** 2$

Estimated function    estimated var = expression    e.g.  $v2 = \text{constant} + \text{beta} * v1$   
 Loss function     $L = \text{expression}$     e.g.  $L = (\text{obs} - \text{pred}) ** 2$   
 valid operators: + \* \*\* = /  
 Reference variables by number or name    e.g.  $v3 = b1 * v4$  or  $\text{COS1} = b1 * \text{SIZE}$   
 All unrecognized names are parameters    e.g.  $v3 = \text{const} + \text{beta} * v4$   
 Use standard or scientific notation.    e.g.  $v3 = b1 * v1 / 3e+2$   
 Constants:  $\text{Pi} = 3.14$      $\text{Euler} = 2.71$     e.g.  $v3 = b * \text{Euler} * v1$   
 Functions: abs arcsin cos exp log log2 log10 sign sin sinh sqrt ar  
 Logical operations: true=1    false=0    e.g.  $v2 = b1 * v3 * v1 / (1 + b2 * v3 * v1)$   
 In loss function: PRE D = predicted value    OBS = observed value  
 Default loss function is 'Least Squares' that is  $L = (\text{OBS} - \text{PRE D}) ** 2$   
 Example: Failure =  $\exp(b0 + b1 * \text{Strength})$      $L = v5 * (\text{OBS} - \text{PRE D}) ** 2$   
 Example 2:  $v4 = \exp(a + b1 * v4) / (1 + \exp(a + b1 * v4))$      $L = \text{weight} * \text{abs}(\text{OBS} - \text{PRE D})$

Buttons: OK, Cancel, Open, Save As, Variables

Correlations  
NEW STA  
10v%De...





## Model Estimation

Model is:  $v2 = \text{const } 3 * v1 + \text{const } 4$ 

Number of parameters to be estimated: 2

Loss function: OBS PRED \*\*2

Dependent variable: VAR2

Independent variables: VAR1

Missing data are casewise deleted

Number of valid cases: 7

Estimation method: Quasi-Newton

☐ Asymptotic standard errors☐  $\chi^2$  test of model fit: 8

Maximum number of iterations: 50

Convergence criterion: 0.00010

☐ Start values: 1 for all parameters☐ Initial step size: 50 for all parameters☐ Means & standard deviations☐ Matrix plot for all variables☐ Box & whisker plot for all vars

OK

Cancel

NEW STA

10/1/00

For help Press F1

Output OFF

Sel OFF

Weight OFF

## Model Estimation

Model 18:  $v2 = \text{const } 3 * v1 + \text{const } 4$ 

Number of parameters to be estimated 2

Loss function: OBS PRED \*\*2

## Parameter Estimation

Iteration	Loss	Parameters
* 2	29.0256	1.01838 6 26275
* 3	14.5798	1.42003 4 79798
* 4	10.2768	1.80349 3 44654
* 5	10.2768	1.80352 3 44665
* 6	10.2768	1.80352 3 44662
* 7	10.2768	1.80357 3 44643
* 8	10.2768	1.80357 3 44643
*		

Parameter estimation process converged

Cancel

OK

Convergence criterion: 0.0010

Start values 1 for all parameters

Initial step size 50 for all parameters

Means & standard deviations

Matrix plot for all variables

Box & whisker plot for all vars

NEW STA

10/1/00

For help Press F1

Output OFF

Set OFF

Weight OFF

## Results

Model is  $v2 = \text{const } 3 * v1 + \text{const } 4$ 

Dependent variable: VAR2

Independent variables: 1

Loss function: OBS PRED \*\*2

Final value: 10.276785714

Proportion of variance accounted for: 898608.75 R = 94.7949458

Parameter estimates

Fitted 2D function &amp; observed vals

OK

Cancel

Distribution of residuals

Residual values

Normal probability plot of residuals

Predicted values

Half-normal probability plot

Observed values

Predicted vs. observed values

Means &amp; standard deviations

Predicted vs. residual values

Matrix plot for all variables

Save predicted and residual values

Box &amp; whisker plot for all vars.

NEW STA

10x10x...

For help Press F1

Output OFF

Sel OFF

Weight OFF

**STATISTICA: Nonlinear Estimation**

File Edit View Analysis Graphs Options Macro Window Help

1.8035714

Data: NEW.STA 10v \* 10c

#	1 VAR1	2 VAR2	3 VAR3	4 VAR4	5 VAR5	6 VAR6	7 VAR7
1	0.000	2.500	3.000				
2	1.000	5.500	5.000				
3	2.000	7.000	7.000				
4	3.000	9.000	9.000				

Model: v2=const3\*v1+const4 [new.sta]

Continue... Dep. var: VAR2 Loss: (OBS-PRED)\*\*2  
Final loss: 10.276785714 R= .94795 Variance explained: 89.861%

N=7	CONST3	CONST4
Estimate	1.803571	3.445629



Results



Correlations  
(NEW.STA  
10v\*10c)

Ready Output:OFF Set:OFF Weight:OFF

3.446430

Redraw

Exit+Redraw



Data: NEW.STA 10v \* 10c

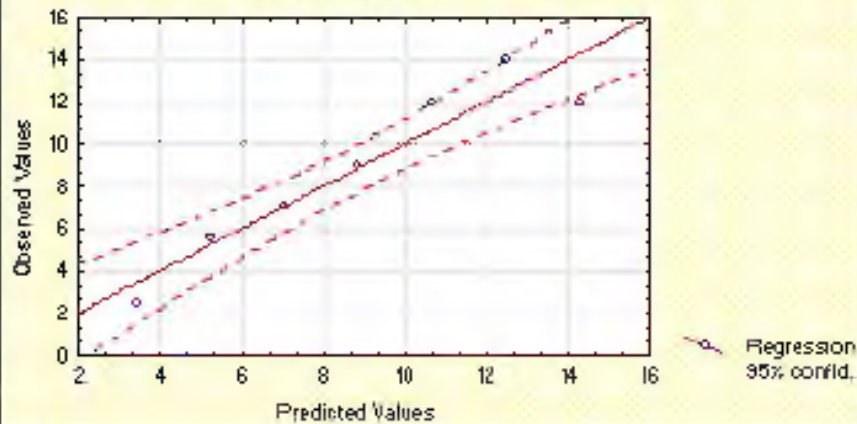
Observed versus Predicted Values

Continue...

Observed versus Predicted Values

Observed Values = .00000 + 1.00000 \* Predicted Values

Correlation: r = .94795



Graph Data: Obscr

Observed versus Predicted  
Observed Values = .00000

Regression

Scatterplot

	X	Y
1	3.45	2.50
2	5.25	5.50
3	7.05	7.00
4	8.86	9.00
5	10.66	12.00
6	12.46	14.00
7	14.27	12.00
8		



Results

Correlations  
(NEW.STA  
10v\*10c)

Ready

Output:OFF

Set:OFF

Weight:OFF



